velocity C_2 is obtained at which the steam passes away from the turbine stage.

From the vector diagram the driving force due to the steam can be calculated, and thence the efficiency of the stage ascertained.

The change of tangential velocity in the steam passing through the blading is given by the tangential components of *w±* and *w^* thus:

Let the ratio of _J

= velocity coefficient of blading.

Experiments show that the value of ^ for a well-shaped blade lies between the values of 0-8 and 0-9, according to the velocity of the steam and the angle of deflection in the blading.

Also let it be assumed that the angle /3 of blading is equal to angle *0* at which the steam enters the blades, this being approximately true in most cases. Then

change of tangential velocity = AB + AC
= (Q cosa — *u)(i +* VO;

driving force per pound of steam = ~(C_X cosa — *u)(i +* VOl
o

work done per pound of steam = (driving force) X (blade speed)

= -(C_a cosa - $_{tt}$)(i + VO-
g

But work available in steam is that due to the theoretical steam speed C_0,

^*l.* ft.-lb., and QL = $0C_0$.

cosq — -rn ,. rr . 2«(l +
C_0 Blading efficiency = — ^ —

= 2(1 + V0(0$^{r\ cosa}$ ~~~ ^^{2})>

where *r* = ratio *u/*C_Q .

For any definite values of <£, Vs $^{an(}$l ^{a} this curve takes the form of a parabola, and for usual values met in practice the efficiency reaches a maximum at a value of the ratio *r* of approximately 0-46. Fig. 7 shows at A a typical efficiency curve of simple impulse stage for varying values of *r.*

The Velocity Compounded Stage. — It will be seen from fig. 7 that where the ratio *r* is low the possible efficiency is also poor. To improve the efficiency where low values of $r_{\%}$ become necessary a

velocity compounded wheel is employed. Referring to fig. 8, the steam on leaving the first row of moving blades at a velocity C_2 is deflected through a row of fixed return blades into a .second row of moving blades. The velocity diagram for the complete stage is shown, and in this case the change of tangential velocity becomes the sum of the tangential components of $W_{1?}$ W_2, W_3, and W_4, and the efficiency curve at the lower values of *r* is improved as indicated at curve